U.S. Department of Transportation

MECHANICAL DAMAGE INSPECTION USING MFL TECHNOLOGY

OPS ACCOMPLISHMENTS

Damage Prevention and Leak Detection For Pipeline Safety Research & Development

Challenge

Magnetic flux leakage (MFL) pigs are successfully used to inspect transmission pipelines for corrosion. However, current MFL technology does not reliably detect mechanical damage caused by excavation equipment. The reason is that the strong magnetic fields used to assess corrosion are not sensitive to many mechanical damage defect features. A tool would need to use moderate magnetic fields to detect the defect signatures of mechanical damage. A recent design concept for a new MFL tool called for two magnetizers, but it has not been made available commercially because of its increased size and complexity.

Technology Description

Pipeline inspection equipment must distinguish the many benign dents from the few that affect safety and serviceability. The mechanical damage pig is designed to use both high and moderate magnetic field levels to detect the few mechanical damage defects that could grow to become a leaks or ruptures. Both magnetic field levels are required to reliably detect stresses and cold working associated with significant mechanical damage defects. The high magnetic field level is also capable of assessing corrosion.

Backhoe excavating on a pipeline right of way.

Accomplishments

An innovative analysis method was developed to combine data from two magnetic field levels to isolate geometry and stress information. Decoupling, as the method is called, has been demonstrated on hundreds of mechanical damage defects at Battelle's Pipeline Safety and Reliability Center (PS&RC).

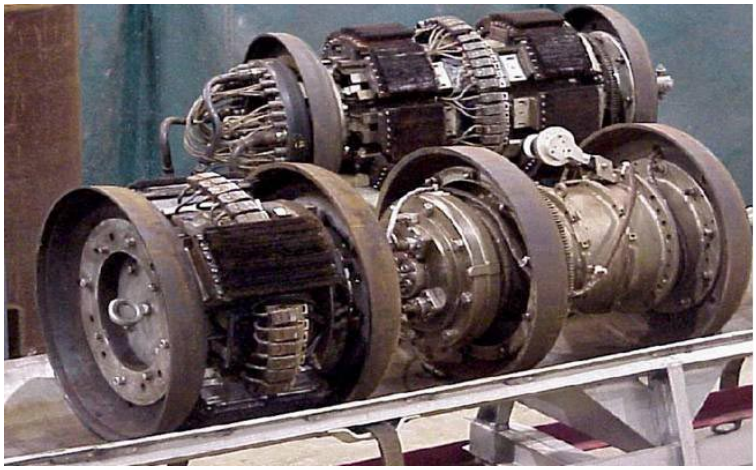
Failure at a 6% dent. Other dents can be seen along the pipe

Contact

James Merritt
R&D Program Manager
(303) 683-3117 office
(303) 638-4758 mobile
(303) 346-9192 fax
James.Merritt@rspa.dot.gov

Office of Pipeline Safety

Research & Special Programs Administration



Axial and Circumferential MFL Pigs

Benefits

A pig to detect mechanical damage alone would have limited commercial potential, since the cost of running a specialized pig would have to be weighed against the benefit of detecting the small number of delayed mechanical damage failures. However, a pig that detects both corrosion and mechanical damage in a single inspection would benefit the pipeline industry by keeping the impact of pigging on pipeline operations constant, while increasing pipeline safety and lowering operational risk. The pig being developed in this program will be simple to implement and use, and it will not require modification of pig launchers and receivers.

Future Activities

The project is currently establishing specifications for a single magnetizer design that provides the signals of the two-magnetizer technology. The device will be fabricated and tested at Battelle's Pipeline Safety and Reliability Center (PS&RC). Test results will be analyzed to compare the capability of the new tool design to that achievable using the two magnetizer approach.

Partners in Success

- **Battelle Memorial Institute www.battelle.org/pipetechnology/**
- **Pipeline Research Council International, Inc. (PRCI) www.prci.com**
- **Gas Technology Institute www.gri.org**

U.S. Department of Transportation